CLAIMS

1. A method for processing digital data, the method comprising:

receiving digital data;

identifying code values of an input representation of the received digital data, the code values having variable bit widths and representing data values for one or more representation components;

for each representation component, generating a first bit width distribution that defines a respective frequency of occurrence for two or more different bit widths based on bit widths of data values for that representation component in the input representation; and

using the generated first bit width distributions to estimate a storage size of an output representation that uses code values having variable bit widths to represent the digital data.

2. The method of claim 1, wherein:

receiving digital data includes receiving the digital data in the input representation.

3. The method of claim 1, wherein the representation components include frequency components of a discrete Fourier transform or a discrete cosine transform.

4. The method of claim 1, wherein the digital data includes a digital image.

5. The method of claim 4, wherein the input representation includes an input JPEG representation of the digital image.

6. The method of claim 5, wherein the output representation includes an output JPEG representation of the digital image.

7. The method of claim 5, further comprising:

generating the input JPEG representation from a bitmap representation of the digital

image.

8. The method of claim 7, wherein:

generating the input JPEG representation includes sampling the bitmap representation of the digital image.

9. The method of claim 1, wherein the input representation includes markers to identify code values, the markers being encoded based on a first Huffman encoding.

10. The method of claim 9, wherein the markers include code heads and end-of-block markers.

11. The method of claim 9, wherein the output representation includes markers encoded based on a second Huffman encoding.

12. The method of claim 11, wherein the second Huffman encoding is different from the first Huffman encoding.

13. The method of claim 1, wherein:

estimating a storage size of the output representation includes estimating a total number of bits in the output representation.

14. The method of claim 1, wherein:

estimating a storage size of the output representation includes estimating a transmission time for transmitting the output representation over a link.

15. The method of claim 1, further comprising:

receiving one or more compression parameters for the output representation.

16. The method of claim 15, wherein estimating the storage size of the output representation includes:

determining a respective bit reduction for each representation component based on one or more of the compression parameters;

for each representation component, modifying the first bit width distribution based on the respective bit reduction to generate a second bit width distribution that specifies estimated frequencies of occurrence for bit widths in the output representation; and

using the second bit width distribution to estimate the storage size of the output representation.

17. The method of claim 16, wherein the compression parameters specify a respective quantizor for each representation component, and wherein:

determining the respective bit reduction for each representation component includes determining the respective bit reduction based on the respective quantizor for each representation component.

18. The method of claim 16, wherein estimating the storage size of the output representation includes:

for each representation component, estimating a respective average number of code bits for each bit width in the second bit width distribution; and

using the second bit width distribution to estimate the storage size includes multiplying the respective average number of code bits with the estimated frequencies of occurrence specified by the second bit width distribution.

19. The method of claim 18, wherein:

the corresponding average number of bits is estimated based on bit widths in the input representation.

20. The method of claim 15, wherein the digital data includes a digital image and the compression parameters specify an output pixel resolution of the digital image in the output representation, and wherein:

estimating the storage size of the output representation includes estimating the storage size based on the output pixel resolution.

21. The method of claim 20, wherein the input representation specifies an input pixel resolution of the digital image, and wherein:

estimating the storage size based on the output pixel resolution includes using a square root of the ratio of the input pixel resolution and the output pixel resolution.

22. A method for processing digital data, the method comprising:

receiving digital data in a current representation;

receiving one or more target parameters for compressing the digital data into an output representation;

based on the target parameters, determining one or more compression parameter values for the output representation; and

predicting a storage size of the output representation based on the compression parameter values, the storage size being predicted without generating the output representation with the compression parameter values.

23. The method of claim 22, wherein the output representation uses a variable length encoding to represent data values.

24. The method of claim 23, wherein predicting a storage size of the output representation includes:

identifying code values of an input representation of the received digital data, the code values having variable bit widths and representing data values for one or more representation components;

for each representation component, generating a bit width distribution defining a respective frequency of occurrence for two or more different bit widths based on bit widths of data values for the representation component in the input representation; and

estimating a storage size of the output representation based on the generated bit width distributions.

25. The method of claim 24, wherein:

receiving digital data in the current representation includes receiving digital data in the input representation.

26. The method of claim 22, wherein:

receiving digital data includes receiving a set of two or more digital images.

27. The method of claim 26, wherein:

predicting a storage size of the output representation includes predicting a total storage size for the set of digital images.

28. The method of claim 27, wherein determining one or more compression parameter values includes:

selecting one or more of the images for compression; and

determining one or more compression parameter values for the selected images.

29. The method of claim 28, wherein:

receiving one or more target parameters for compressing the digital data includes receiving a target quality; and

selecting one or more of the images to be compressed includes selecting one or more of the images based on the target quality and quality parameters of the digital images in the current representation.

30. The method of claim 28, wherein:

selecting one or more of the images for compression includes selecting one or more of the images based on storage sizes of the digital images in the current representation.

31. The method of claim 30, wherein:

selecting one or more of the images based on storage sizes includes selecting one or more images having the largest storages sizes among the received images.

32. The method of claim 22, wherein:

predicting the storage size of the output representation includes predicting a total number of bits in the output representation.

33. The method of claim 22, wherein:

predicting the storage size of the output representation includes predicting a transmission time for transmitting the output representation over a link.

34. The method of claim 22, wherein:

receiving one or more target parameters includes receiving user input in a user interface, the received user input specifying a sequence of input values for a target parameter.

35. The method of claim 34, wherein predicting the storage size of the output representation includes predicting the storage size of the output representation for each input value in the sequence of input values, the method further comprising:

in the user interface, displaying the predicted storage size of the output representation for each input value in the sequence without a perceivable delay relative to the time of receiving the input value.

36. The method of claim 22, wherein:

receiving one or more target parameters includes receiving one or more values of a target quality parameter for the output representation.

37. The method of claim 36, wherein:

determining one or more compression parameters includes determining one or more quantizors for the output representation based on the received values of the target quality parameter.

38. The method of claim 22, wherein:

receiving one or more target parameters includes receiving a target storage size for the output representation.

39. The method of claim 38, wherein:

determining one or more compression parameter values for the output representation includes setting respective trial values of one or more quality parameters for the output

representation; and

predicting a storage size of the output representation includes predicting a trial storage size for the output representation based on the trial values, and verifying whether the trial storage size is smaller than the target storage size.

40. The method of claim 39, wherein:

setting respective trial values of the quality parameters for the output representation includes setting trial values within an allowed range.

41. The method of claim 40, further comprising:

receiving user input modifying the allowed range.

42. A method for processing digital data, the method comprising:

receiving one or more digital images in a current representation;

in a user interface, presenting a graphical representation that indicates a respective storage size for each digital image, the graphical representation including a respective graphics object for each digital image, the respective graphics object including a visual representation of the digital image and having a linear size that is proportional to the storage size of the digital image.

43. The method of claim 42, wherein:

for each digital image, the corresponding graphics object encloses the visual representation of the image.

44. The method of claim 42, wherein:

each digital image is distorted in proportion to the storage size of the image.

45. The method of claim 42, wherein:

for each digital image, the corresponding graphics object has a linear size that is proportional to the storage size of the image in the current representation.

46. The method of claim 42, further comprising:

receiving user input specifying one or more target parameters for an output

representation of the images;

estimating a storage size of one or more images in the output representation based on the received target parameters; and

for each digital image, setting the linear size of the corresponding graphics object to be proportional to the estimated storage size of the image in the output representation.

47. The method of claim 46, wherein receiving user input specifying one or more target parameters includes:

presenting a respective slider for each target parameter in the user interface, wherein at least one of the sliders is a user adjustable slider; and

specifying the target parameters according to a current position of the user adjustable slider.

48. The method of claim 47, wherein a first target parameter has a first allowable range, and wherein:

presenting a slider for the first target parameter includes presenting a representation of the first allowable range in the user interface.

49. The method of claim 48, further comprising:

receiving user input modifying the first allowable range; and

adjusting the representation of the first allowable range in the user interface.

50. The method of claim 46, wherein:

the output representation specifies two or more representation components for each image, and uses code values having variable bit widths to represent data values; and

estimating the storage size of one or more images in the output representation includes estimating the storage size for each representation components in the output representation based on a bit width distribution corresponding to the representation component, the bit width distribution defining a frequency of occurrence for two or more different bit widths based on bit widths of data values for the representation component.

51. The method of claim 42, wherein:

the storage size of at least one digital image specifies a total number of bits representing the at least one image in the output representation.

52. The method of claim 42, wherein:

the storage size of at least one digital image specifies a transmission time for transmitting the at least one image in the output representation over a link.

53. The method of claim 42, further comprising:

presenting a reference storage size in the user interface.

54. A system for processing digital data, the system comprising:

an input device to receive user input specifying parameters for generating an output representation of digital data, the output representation using code values having variable bit widths to represent the digital data; and

a data processing device configured to:

identify code values of an input representation of the digital data, the code values having variable bit widths and representing data values for one or more representation components;

generate a first bit width distribution for each representation component, the first bit width distribution defining a respective frequency of occurrence for two or more different bit widths based on bit widths of data values for the representation component in the input representation; and

use the generated first bit width distributions to estimate a storage size of the output representation.

55. The system of claim 54, wherein the data processing device includes one or more components of a computer.

56. The system of claim 54, wherein the data processing device includes data processing components in a portable image capturing or image displaying device.

57. The system of claim 54, further comprising:

a data storage device having an available storage capacity to store the digital data.

58. The system of claim 57, wherein:

the data processing device is configured to determine compression parameters for the output representation of the digital data based on the available storage capacity of the data storage device.

59. The system of claim 54, further comprising:

a display device to present the estimated storage size of the output representation.

60. The system of claim 59, wherein the digital data includes one or more digital images, and wherein:

the data processing device is configured to generate a graphical representation to indicate a respective storage size for each digital image, the graphical representation including a respective graphics object for each digital image, the respective graphics object including a visual representation of the digital image and having a linear size that is proportional to the storage size of the digital image; and

the display device is configured to present the generated graphical representation.

61. A software product, tangibly embodied in a machine-readable medium, for processing digital data, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving digital data;

identifying code values of an input representation of the received digital data, the code values having variable bit widths and representing data values for one or more representation components;

for each representation component, generating a first bit width distribution that defines a respective frequency of occurrence for two or more different bit widths based on bit widths of data values for that representation component in the input representation; and

using the generated first bit width distributions to estimate a storage size of an output representation that uses code values having variable bit widths to represent the digital data.

62. The software product of claim 61, wherein:

receiving digital data includes receiving the digital data in the input representation.

63. The software product of claim 61, wherein the representation components include frequency components of a discrete Fourier transform or a discrete cosine transform.

64. The software product of claim 61, wherein the digital data includes a digital image.

65. The software product of claim 64, wherein the input representation includes an input JPEG representation of the digital image.

66. The software product of claim 65, wherein the output representation includes an output JPEG representation of the digital image.

67. The software product of claim 65, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

generating the input JPEG representation from a bitmap representation of the digital image.

68. The software product of claim 67, wherein:

generating the input JPEG representation includes sampling the bitmap representation of the digital image.

69. The software product of claim 61, wherein the input representation includes markers to identify code values, the markers being encoded based on a first Huffman encoding.

70. The software product of claim 69, wherein the markers include code heads and end-of-block markers.

71. The software product of claim 69, wherein the output representation includes markers encoded based on a second Huffman encoding.

72. The software product of claim 71, wherein the second Huffman encoding is different from the first Huffman encoding.

73. The software product of claim 61, wherein:

estimating a storage size of the output representation includes estimating a total number of bits in the output representation.

74. The software product of claim 61, wherein:

estimating a storage size of the output representation includes estimating a transmission time for transmitting the output representation over a link.

75. The software product of claim 61, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving one or more compression parameters for the output representation.

76. The software product of claim 75, wherein estimating the storage size of the output representation includes:

determining a respective bit reduction for each representation component based on one or more of the compression parameters;

for each representation component, modifying the first bit width distribution based on the respective bit reduction to generate a second bit width distribution that specifies estimated frequencies of occurrence for bit widths in the output representation; and

using the second bit width distribution to estimate the storage size of the output representation.

77. The software product of claim 76, wherein the compression parameters specify a respective quantizor for each representation component, and wherein:

determining the respective bit reduction for each representation component includes

determining the respective bit reduction based on the respective quantizor for each representation component.

78. The software product of claim 76, wherein estimating the storage size of the output representation includes:

for each representation component, estimating a respective average number of code bits for each bit width in the second bit width distribution; and

using the second bit width distribution to estimate the storage size includes multiplying the respective average number of code bits with the estimated frequencies of occurrence specified by the second bit width distribution.

79. The software product of claim 78, wherein:

the corresponding average number of bits is estimated based on bit widths in the input representation.

80. The software product of claim 75, wherein the digital data includes a digital image and the compression parameters specify an output pixel resolution of the digital image in the output representation, and wherein:

estimating the storage size of the output representation includes estimating the storage size based on the output pixel resolution.

81. The software product of claim 80, wherein the input representation specifies an input pixel resolution of the digital image, and wherein:

estimating the storage size based on the output pixel resolution includes using a square root of the ratio of the input pixel resolution and the output pixel resolution.

82. A software product, tangibly embodied in a machine-readable medium, for processing digital data, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving digital data in a current representation;

receiving one or more target parameters for compressing the digital data into an output representation;

based on the target parameters, determining one or more compression parameter values for the output representation; and

predicting a storage size of the output representation based on the compression parameter values, the storage size being predicted without generating the output representation with the compression parameter values.

83. The software product of claim 82, wherein the output representation uses a variable length encoding to represent data values.

84. The software product of claim 83, wherein predicting a storage size of the output representation includes:

identifying code values of an input representation of the received digital data, the code values having variable bit widths and representing data values for one or more representation components;

for each representation component, generating a bit width distribution defining a respective frequency of occurrence for two or more different bit widths based on bit widths of data values for the representation component in the input representation; and

estimating a storage size of the output representation based on the generated bit width distributions.

85. The software product of claim 84, wherein:

receiving digital data in the current representation includes receiving digital data in the input representation.

86. The software product of claim 82, wherein:

receiving digital data includes receiving a set of two or more digital images.

87. The software product of claim 86, wherein:

predicting a storage size of the output representation includes predicting a total storage size for the set of digital images.

88. The software product of claim 87, wherein determining one or more compression parameter values includes:

selecting one or more of the images for compression; and

determining one or more compression parameter values for the selected images.

89. The software product of claim 88, wherein:

receiving one or more target parameters for compressing the digital data includes receiving a target quality; and

selecting one or more of the images to be compressed includes selecting one or more of the images based on the target quality and quality parameters of the digital images in the current representation.

90. The software product of claim 88, wherein:

selecting one or more of the images for compression includes selecting one or more of the images based on storage sizes of the digital images in the current representation.

91. The software product of claim 90, wherein:

selecting one or more of the images based on storage sizes includes selecting one or more images having the largest storages sizes among the received images.

92. The software product of claim 82, wherein:

predicting the storage size of the output representation includes predicting a total number of bits in the output representation.

93. The software product of claim 82, wherein:

predicting the storage size of the output representation includes predicting a transmission time for transmitting the output representation over a link.

94. The software product of claim 82, wherein:

receiving one or more target parameters includes receiving user input in a user interface, the received user input specifying a sequence of input values for a target parameter.

95. The software product of claim 94, wherein predicting the storage size of the output representation includes predicting the storage size of the output representation for each input value in the sequence of input values, the software product further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

in the user interface, displaying the predicted storage size of the output representation for each input value in the sequence without a perceivable delay relative to the time of receiving the input value.

96. The software product of claim 82, wherein:

receiving one or more target parameters includes receiving one or more values of a target quality parameter for the output representation.

97. The software product of claim 96, wherein:

determining one or more compression parameters includes determining one or more quantizors for the output representation based on the received values of the target quality parameter.

98. The software product of claim 82, wherein:

receiving one or more target parameters includes receiving a target storage size for the output representation.

99. The software product of claim 98, wherein:

determining one or more compression parameter values for the output representation includes setting respective trial values of one or more quality parameters for the output representation; and

predicting a storage size of the output representation includes predicting a trial storage size for the output representation based on the trial values, and verifying whether the trial storage size is smaller than the target storage size.

100. The software product of claim 99, wherein:

setting respective trial values of the quality parameters for the output representation includes setting trial values within an allowed range.

101. The software product of claim 100, further comprising:

receiving user input modifying the allowed range.

102. A software product, tangibly embodied in a machine-readable medium, for processing digital data, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving one or more digital images in a current representation;

in a user interface, presenting a graphical representation that indicates a respective storage size for each digital image, the graphical representation including a respective graphics object for each digital image, the respective graphics object including a visual representation of the digital image and having a linear size that is proportional to the storage size of the digital image.

103. The software product of claim 102, wherein:

for each digital image, the corresponding graphics object encloses the visual representation of the image.

104. The software product of claim 102, wherein:

each digital image is distorted in proportion to the storage size of the image.

105. The software product of claim 102, wherein:

for each digital image, the corresponding graphics object has a linear size that is proportional to the storage size of the image in the current representation.

106. The software product of claim 102, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving user input specifying one or more target parameters for an output representation of the images;

estimating a storage size of one or more images in the output representation based on the received target parameters; and

for each digital image, setting the linear size of the corresponding graphics object to be proportional to the estimated storage size of the image in the output representation.

107. The software product of claim 106, wherein receiving user input specifying one or more target parameters includes:

presenting a respective slider for each target parameter in the user interface, wherein at least one of the sliders is a user adjustable slider; and

specifying the target parameters according to a current position of the user adjustable slider.

108. The software product of claim 107, wherein a first target parameter has a first allowable range, and wherein:

presenting a slider for the first target parameter includes presenting a representation of the first allowable range in the user interface.

109. The software product of claim 108, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving user input modifying the first allowable range; and

adjusting the representation of the first allowable range in the user interface.

110. The software product of claim 106, wherein:

the output representation specifies two or more representation components for each image, and uses code values having variable bit widths to represent data values; and

estimating the storage size of one or more images in the output representation includes estimating the storage size for each representation components in the output representation based on a bit width distribution corresponding to the representation component, the bit width distribution defining a frequency of occurrence for two or more different bit widths based on bit widths of data values for the representation component.

111. The software product of claim 102, wherein:

the storage size of at least one digital image specifies a total number of bits representing the at least one image in the output representation.

112. The software product of claim 102, wherein:

the storage size of at least one digital image specifies a transmission time for transmitting the at least one image in the output representation over a link.

113. The software product of claim 102, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

presenting a reference storage size in the user interface.